Sample Task Order 2

Degraded Visual Environment Handling Qualities Evaluation

Statement of Work

I. Overview

The contractor will select a current and helicopter/tilt rotor aircraft handling qualities flight dynamics model and conduct an assessment of various flight control modes to enhance and improve degraded visual flight environments (DVE) for civilian and military operations. The International Helicopter Safety Team (IHST) has identified DVE as a significant cause of civilian accidents, particular with smaller helicopters that do not generally have advance control modes available to the pilot. A major contributor to the high accident rate amongst rotorcraft is their inherent instability without advanced control modes that can lead to excessive pilot workload when flying in DVE. The simulation environment for pilot in the loop evaluations will be performed in the NASA Vertical Motion Simulator (VMS).

II. Statement of Work Tasks

System Evaluation Requirements

The simulation study focuses on evaluating the effects of limited authority control system augmentation on handling qualities and task performance in both Good Visual Environments (GVE) and Degraded Visual Environments (DVE). The vehicle simulation model used is to be chosen by the contractor and approved by the Government. The contractor will ensure that includes a partial authority (~10%) Stability and Control Augmentation System (SCAS). This helicopter should be similar in size, weight and performance, and that could be used by local and national law enforcement agencies and also Medical Evacuation (Medevac) and Emergency Medical Services (EMS). An XV-15 sized tilt rotor aircraft is also a valid candidate aircraft. The control systems being investigated should include, but are not limited to, a baseline aircraft Rate Command (RC) system and a Modernized Control Laws (MCLAWS) that provides an Attitude Command/Attitude Hold (ACAH) control response. An advanced full authority fly-by-wire flight control simulation model may be proposed for the same airframe model as a future generation platform to quantify the benefits of new, technology enabling capability.

Approach

The contractor shall select a helicopter/tiltrotor model (herein referred to as the "evaluation aircraft") for implementation and demonstration. The flight dynamics simulation model will be documented and provided to the Government review and approval within two months of contract initiation. The contractor will document the ability of the simulation to capture multiple control system modes mentioned above. The Government will execute coordination and implementation with the VMS Sim Labs to ensure inceptor, displays, visual scene and cockpit compatibility with the VMS facility.

The experiment will be conducted in the NASA Ames Vertical Motion Simulator (VMS) within five months of task initiation. The simulation will use one month of VMS occupancy time. DVE will be simulated in the experiment primarily with the pilot wearing night-vision goggles (NVGs) in a simulated night scene. Several civilian missions including urban operations, austere remote locations, and landing at unprepared sites in the presence of obstacles will be included in the experiment. The test maneuvers include Mission Task Elements (MTEs) from ADS-33 including: hover, pirouette, sidestep, and acceleration/deceleration maneuvers.

III. Deliverables

The contractor shall provide a documented flight dynamics model with multiple control modes for an evaluation aircraft within two months of task initiation. The contractor will provide on-site support for the VMS experiment including research evaluation pilots. A detailed final report describing the system design as well as reporting the results of the VMS experiment described above. Assessments for recommended further control systems hardware/software development, test, and evaluation phases, as risk assessments for each, will be documented in the final report.

IV. Schedule

The contractor shall submit the selected evaluation aircraft model for evaluation within two months of task initiation. The VMS simulation will be performed during month five of the subject contract. The final report shall be delivered to the Government within seven months of task initiation. A final briefing at NASA Ames Research Center will take place at the end of the effort and no later than eight months from task initiation.

V. Travel

The VMS simulation experiment will be supported by two test engineers and several pilots during the evaluation phase of the test program. Separately, two trips to NASA Ames (test preparation and final briefing) for two-day visits by two people should be planned.